SOLE INVENTOR

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APPLICATION FOR UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that I, Alexander I. Wallstein, a German citizen, residing at 652 North Noble Street, Chicago, 60622, in the County of Cook and State of Illinois have invented a new and useful INTERMEDIATE ANCHORAGE FOR CONCRETE STRUCTURES, of which the following is a specification.

INTERMEDIATE ANCHORAGE FOR CONCRETE STRUCTURES

Technical Field of the Invention

The present invention relates to intermediate anchorages for the unbonded post-tensioning tendons used to reinforce concrete slabs and other concrete structures.

Background of the Invention

Concrete slabs and other structures are used to form floors, walls, and other elements of buildings. Each such concrete structure is typically reinforced by placing an unbonded post-tensioning tendon in a form (usually a wood form) prior to pouring of the concrete and then tensioning the tendon after the concrete has been poured into the form and has set. This reinforcement permits the concrete structure to bear greater loads than would otherwise be the case.

The tendon is composed of a greased high strength steel cable contained within a sheathing. Additionally, the tendon is usually provided with two terminal anchors, one at each end of the concrete structure that is to be reinforced. The tendon is installed in the form and the concrete is poured and allowed to set. The tendon is then tensioned, and the tension on the tendon is locked off at the terminal

anchors. In corrosive environments such as parking garages, corrosion protection is used to protect the tendon and the anchors. Accordingly, it is known to provide sleeves and seals behind the terminal anchors and caps and seals on the frontsides of the terminal anchors.

When concrete slabs and other structures are so large that they require two or more pours, intermediate anchors between the terminal anchors are added to the tendon at the construction joint between the different pours. In order to install an intermediate anchor, the intermediate anchor is positioned at the construction joint and the first pour of concrete is made. After this concrete has set, sheathing is stripped from the tendon on the frontside of the intermediate anchor so as to expose a long portion of the cable. A jack is applied so that it grips this exposed portion with wedges (tensioning grippers) and is operated to tension the tendon. A wedge is then installed in the intermediate anchor so that it grips the cable where the sheathing has been stripped away to thereby hold the tension. The length of sheathing that is stripped away is typically equal to the length of the jack and, therefore, a long length of the cable is exposed.

As in the case of the terminal anchors, corrosion is also a problem where intermediate anchors are used because, even though the intermediate anchor is buried in concrete, concrete is porous allowing water to carry corrosive chemicals such as salt to the portion of the tendon that has been stripped of sheathing. Therefore, the tendon at the intermediate anchor must also be provided with corrosion protection.

This corrosion protection is traditionally provided by covering the stripped portion of the tendon on the backside of the intermediate anchor with a split plastic tube or a long solid plastic tube with split seals. Split seals are also provided on the frontside of the intermediate anchor in an attempt to connect back to the sheathing. However, these traditional corrosion protection systems do not provide adequate corrosion protection.

The present invention is directed to a sealing arrangement and method for use in connection with an intermediate anchor that overcomes one or more of the problems of the prior art.

Summary of the Invention

In accordance with one aspect of the present invention, a method comprises the following: (i) placing an intermediate anchor having a wedge hole at a concrete construction joint; (ii) inserting a tendon through the intermediate anchor leaving a sheathing of the tendon substantially intact; (iii) making a single cut circumferentially around the sheathing inside the wedge hole; (iv) tensioning the sheathed tendon following setting of concrete poured on a bearing side of the concrete construction joint, whereby the tensioning causes the sheathing to pull away from the single cut so as to thereby create an exposed portion of the tendon; and, (v) gripping the exposed portion with a wedge to hold the tension.

In accordance with another aspect of the present invention, an intermediate anchor system for a tendon comprises an intermediate anchor and backside and frontside seals. The intermediate anchor has a backside, a frontside, and a wedge hole arranged to receive a wedge. The backside and frontside seals are at the backside and the frontside, respectively, of the intermediate anchor. The backside and frontside seals are arranged to seal an exposed portion of the tendon

within the wedge hole, and the exposed portion of the tendon is confined to the wedge hole.

In accordance with still another aspect of the present invention, an intermediate anchor system comprises a tendon, an intermediate anchor, a wedge, a backside seal, and a frontside seal. The tendon has a greased cable within a sheathing, the tendon has an exposed portion, and the exposed portion has no sheathing. The intermediate anchor having a backside, a frontside, and a wedge hole arranged to receive a wedge. The sheathed tendon extends through the intermediate anchor so that the exposed portion is within the wedge hole. The wedge is within the wedge hole and is clamped to the exposed portion of the sheathed tendon. The backside seal engages the sheathed tendon at the backside of the intermediate anchor. The frontside seal engages the sheathed tendon at the frontside of the intermediate anchor. The backside and frontside seals seal the exposed portion of the sheathed tendon.

In accordance with yet another aspect of the present invention, a method comprises the following: (i) placing an intermediate anchor having a wedge hole at a concrete construction joint; (ii) inserting a tendon through the intermediate anchor leaving a sheathing of

the tendon substantially intact; (iii) sealing the intermediate anchor on a bearing side of the concrete construction joint; (iv) making a cut circumferentially around the sheathing in the wedge hole; (v) tensioning the sheathed tendon following setting of concrete poured on the bearing side of the concrete construction joint, thereby creating an exposed portion of the tendon; (vi) gripping the exposed portion with a wedge to hold the tension; and, (vii) sealing the intermediate anchor on a stressing side of the concrete construction joint.

In accordance with a further aspect of the present invention, an intermediate anchor is provided to anchor a tendon in concrete. The tendon has an outside diameter. The intermediate anchor has an O-ring to provide a seal between the intermediate anchor and the tendon, and the O-ring has an inside diameter. The inside diameter of the O-ring is sufficiently larger than the outside diameter of the tendon in order to permit the O-ring to move freely over the tendon during installation.

Brief Description of the Drawing

These and other features and advantages of the present invention will become more apparent from a

detailed consideration of the invention when taken in conjunction with the single figure of the drawing which is a partially sectioned side view of a tendon and an intermediate anchor system according to at least one embodiment of the present invention.

Detailed Description

An intermediate anchor system 10 according to one embodiment of the present invention is shown in the drawing. The intermediate anchor system 10 includes an anchor main body 12 (usually a ductile iron casting) and a cover 14 (usually a plastic coating) together forming an encapsulated intermediate anchor 16. The cover 14 has a neck 18 on a backside of the encapsulated intermediate anchor 16. The neck 18 receives a neck 20 of an adaptor 22. The neck 20 of the adaptor 22 has an external rib 24 that is formed around its perimeter and that mates with an internal recess 26 of the neck 18 so that the adaptor 22 is positively coupled to the encapsulated intermediate anchor 16 of the intermediate anchor system 10. The adaptor 22 also has an internally threaded portion 28 that receives a backside O-ring seal 30 and an externally threaded backside bushing 32.

The encapsulated intermediate anchor 16, the adaptor 22, the backside O-ring seal 30, and the externally threaded backside bushing 32 are located on a bearing side 34 of a construction joint 36. Accordingly, during installation of the intermediate anchor system 10, the encapsulated intermediate anchor 16 is suitably attached to a form 37 such as by nailing it to the form 37 at the construction joint 36. A tendon 38 is inserted through the externally threaded backside bushing 32, the backside O-ring seal 30, the adaptor 22, and the encapsulated intermediate anchor 16, and is placed in the form 37 so that, when the concrete is poured into the form 37 during a first pour on the bearing side 34, the tendon 38 will have its proper location. The tendon 38 is typically composed of a plastic sheathed high strength steel cable that is greased inside of the plastic sheathing.

The adaptor 22 is affixed to the encapsulated intermediate anchor 16 by inserting the neck 20 into the neck 18 until the external rib 24 snaps into the recess internal recess 26 of the neck 18. The externally threaded backside bushing 32 is then threaded into the adaptor 22 until the backside O-ring seal 30 is forced into sealing engagement with the tendon 38 and the

adaptor 22. Accordingly, the backside O-ring seal 30 together with the adaptor 22 and the tendon 38 seals the encapsulated intermediate anchor 16 on the bearing side 34 of the construction joint 36. A secondary O-ring 30a provides a seal between the adapter 22 and the neck 18 of the encapsulated intermediate anchor 16.

An open cap 40 is applied to a frontside of the encapsulated intermediate anchor 16 and has a rib 42 around an external perimeter of the open cap 40. The encapsulated intermediate anchor 16 has a complementary rib 44 around an internal perimeter thereof. The open cap 40 has an internally threaded portion 46 that threadably engages an externally threaded frontside bushing 48. The open cap 40, the externally threaded frontside bushing 48, and an O-ring 50 are placed on the tendon 38, but are not engaged to one another until tensioning of the tendon 38 on the bearing side 34 is complete. To permit the O-ring 50 to move easily over the tendon 38, the inner diameter of the O-ring 50 is at least somewhat larger than the outer diameter of the tendon 38. This feature is important because intermediate anchors are applied to tendons off-site and the tendons with their corresponding intermediate anchors mounted thereon are then moved to the site for final

installation. Therefore, it is frequently necessary to move intermediate anchors over long runs of their tendons which could damage the O-rings if the O-rings cannot move freely over their tendons.

Concrete may then be poured on the bearing side 34 of the construction joint 36. A pocket former may be applied to the encapsulated intermediate anchor 16 prior to pouring of the concrete in order to prevent concrete from flowing into a wedge hole 52 of the encapsulated intermediate anchor 16. After pouring, this pocket former may then be removed.

Once the concrete sets on the bearing side 34, a circumferential cut is made around the sheathing of the tendon 38 within the wedge hole 52 of the encapsulated intermediate anchor 16. The tendon 38 is then tensioned by placing the nose of a hydraulic jack against the encapsulated intermediate anchor 16 on a stressing side 54 of the construction joint 36. A gripper wedge 56 is placed on the tendon 38 at the opposing end of the hydraulic jack so that the gripper wedge 56 penetrates the sheathing of the tendon 38 and engages the steel cable within the sheathing. The tendon 38 is tensioned with the gripper wedge 56 by use of the jack.

During tensioning, the steel cable of the tendon 38 stretches. Because the sheathing is bonded to the cured concrete on the bearing side 34, the sheathing of the tendon 38 in the wedge hole 52 will open as the steel cable stretches, thereby creating an exposed portion 58 in the sheathing. After a proper amount of tensioning has been applied to the tendon 38, a permanent wedge 60 surrounding the exposed portion 58 of the tendon 38 is placed into the wedge hole 52 of the encapsulated intermediate anchor 16. When the jack is released, force is transferred from the gripper wedge 56 to the permanent wedge 60 so as to lock off the tension in the tendon 38 on the bearing side 34 of the construction joint 36.

The open cap 40 is then attached to the encapsulated intermediate anchor 16 so that the rib 42 is captured by the corresponding rib 44 to thereby lock the open cap 40 onto the encapsulated intermediate anchor 16 and to thereby compress a gasket 61 to form a seal between the open cap 40 and the encapsulated intermediate anchor 16. The externally threaded frontside bushing 48 is threaded into the internally threaded portion 46 until the frontside O-ring seal 50 is biased against the tendon 38 and against the internally threaded portion 46 of the open cap 40 to form a seal around the tendon 38 to

thereby seal the encapsulated intermediate anchor 16 on the stressing side 54 of the construction joint 36.

Also, the gripper wedge 56 penetrates the sheathing during tensioning of the tendon 38, thereby damaging the sheathing at that location. This damaged portion of the sheathing may be repaired such as by taping so as to restore the integrity of the sheathing.

Accordingly, the exposed portion 58 of the tendon 38 is sealed by the encapsulated intermediate anchor 16, the adaptor 22, the backside O-ring seal 30, and the externally threaded backside bushing 32 on the bearing side 34 of the construction joint 36, and by the encapsulated intermediate anchor 16, the open cap 40, the frontside O-ring seal 50, and the externally threaded frontside bushing 48 on the stressing side 54 of the construction joint 36. Thereafter, concrete may be poured into the form 37 during a second pour on the stressing side 54.

Certain modifications of the present invention will occur to those practicing in the art of the present invention. Accordingly, the description of the present invention is to be construed as illustrative only and is for the purpose of teaching those skilled in the art the best mode of carrying out the invention. The details may

be varied substantially without departing from the spirit of the invention, and the exclusive use of all modifications which are within the scope of the appended claims is reserved.